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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/444,173	11/19/1999	FONG PONG	HP10981470-1	8306

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IP ADMINISTRATION  
LEGAL DEPARTMENT 20BN  
HEWLETT PACKARD COMPANY  
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EXAMINER
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SONG, JASMINE

ART UNIT	PAPER NUMBER
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2187

DATE MAILED: 03/13/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

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**Office Action Summary**

Application No.

09/444,173

Applicant(s)

PONG, FONG

Examiner

Jasmine Song

Art Unit

2187

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 18 January 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## **Detailed Action**

### **Specification**

1. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

### **Claim Rejections - 35 USC § 103**

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al., U.S. Patent 6119204.

Regarding claims 1,9 and 19, Chang et al. teach a method for accessing memory in a multiprocessor system, the method comprising:

from a requesting processor, issuing a request for a block of data to one or more other processors and memory is taught as interconnect 16 includes a broadcast fabric , each device connected to interconnect 16 preferably snoops all communication transactions on interconnect 16 (Fig.1, 2 and 3, col. 7, lines 35-38 and col.4, lines 23-34), each copy of the block of data being associated with state information indicating

whether the copy is valid or invalid is taught as sourcing data cached within cache hierarchy 36 on interconnect 16, updating the coherency state of cached data, invalidating entries within the TLB of processor 10 (Fig.2, col.4, lines 47-62);

in each of the processors and memory that receive the request, checking to determine whether a valid copy of the block of data exists (col.7, lines 39-43); and

returning a valid copy of the requested data from one of the other processors or memory is taught as a snooping processor provides an appropriate response to initiating processor (col.11, lines 46-52).

Chang does not specifically teach that only one processor or memory responds to the request for the valid data. However, it is well known in the memory art of multiprocessor systems for the ownership of the requested data be a necessary component in which element provides the valid data to the requesting device. In order to maintain coherency of data within these systems only one processor will have the ownership rights for changing the data and depending on other activities in the system, the data may be in a modified state and either written back to the main/shared memory or held by that processor in a memory (cache, buffer or other type memory) until it is time to perform the write-back operation to update the main/shared memory. In this situation, the valid data can only be provided by the processor that owned the data in a state that allowed the data to be modified or by the main/shared memory if the modified data has been written back to the main/shared memory. It would have been obvious to one of ordinary skill in the memory art at the time the invention was made for the valid data to be provided to the requester by either the processor that modified the data or

the main/shared memory because the processor that modified the data or the main/shared memory are the only sources for the valid data and official notice is taken thereof. Maintaining coherency in a multiprocessor system with a main/shared memory requires specific maintenance of the ownership of the data, otherwise, the data becomes corrupt and the data within this system is no longer reliable. Combining the requirement of only one processor having ownership rights to modify the data which sets forth situations in which only the processor with such ownership rights and possibly the main/shared memory also contain the modified data with the other limitations of the claims provides a well known method for maintaining data coherency within the system.

Regarding claims 2 and 10, Chang teach each of the processors communicates with the memory via a memory controller (col.4, lines 20-22) and each of the processors has a point-to-point link with the memory controller for issuing a request for a block of data to the memory controller (Fig.1 & Fig.2).

Regarding claims 3 and 11, Chang teach each point-to-point link includes two dedicated and unidirectional links (Fig.2, the lines indicating "to interconnect" and "from interconnect").

Regarding claims 4 and 12, Chang teach the point-to-point links are control links for sending and receiving requests for blocks of data (Fig. 2)

Regarding claims 5 and 13, Chang teach each of the processors has a control path point-to-point link for sending and receiving requests for blocks of data, and a data path point-to-point link for sending and receiving blocks of data (Fig. 2).

Regarding claim 6, Chang teach the processors and shared memory that have an invalid copy of the requested block of data drop the request without responding (col.11, lines 44-54)

Regarding claim 7, Chang teach tracking an identification of a processor that currently has a data block (Fig. 3, element 92); and in response to a cache miss in a requesting processor (Fig. 3), using the identification to specifically target a read request to the processor that currently has the requested data block (Fig. 3, col.7, lines 12-38).

Regarding claim 8, Chang teach maintaining a directory indicating the one or more processors that have a copy of a block of data (Fig.3 element 84); when the block of data is modified, using the directory to issue a write invalidation or write update only to the processors that have the copy of the block of data (col.7, lines 6-12).

Regarding claims 14,15 and 16, Chang teach a directory indicating which processors have a copy of a data block; wherein the processors are in communication

with the directory to identify which other processors have a copy of the data block, and directing requests for the data block only to processors that have a copy of the data block (Fig. 3, col.6, lines 53 to col.7, lines 38).

Regarding claim 17, Chang teach the memory controller is in communication with a shared cache, separate from caches of the processors, for buffering most frequently accessed data block (col.7, lines 2-5).

Regarding claims 18, Chang teach each block has state information indicating which processor currently has a valid copy of a data block, and wherein the processors utilize the state information to specially address a processor having the valid copy in response to a cache miss in a requesting processor (Fig. 3, col.6, lines 47 to col.7, lines 2).

Regarding claim 20, Chang teach each of the processors and the shared memory is in communication with a control path interconnect, and each of the processors is in communication with the control path interconnect via a point-to-point link for receiving and sending requests for blocks of data (Fig. 1 and Fig.2);

each of the processors having a corresponding request queue connecting the point-to-point link of the processor to the control path interconnect (col.8, lines 34-40), and each of the processors having a corresponding snoop queue connecting the point-to-point link of the processor to the control path interconnect (col.4, lines 53-62);

the request queue in communication with a corresponding processor for buffering requests for blocks of data by the processor and issuing the requests to other processors via the control path interconnect (col.4, lines 49-53); and

the snoop queue in communication with a corresponding processor for buffering requests for blocks of data destined for the processor (col.4, lines 53-63).

### **Response to Amendment**

4. Applicant's arguments filed 01/18/2002 have been fully considered but they are not persuasive

5. In response to applicant's argument that Chang's reference does not address returning a copy of valid data to a requesting processor after entries have been invalidated. Examiner made 103 rejection and please refer to rejection above.

6. In response to applicant's argument that Chang's reference does not teach responding to requests for data. It is, however, noted that this limitation is implied in Chang's reference because one of the processors have to send the request for a block of data in order to know which processor has the ownership to access the memory system. Also, It is noted that Chang's reference teach data requests or memory mapped I/O issued on interconnect by BIU which means send data request to one of processor and memory system (Fig.1 and 2 and 3, col. 7, lines 35-38).



### Conclusion

7. When responding to the office action, Applicant is advised to clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. He or she must also show how the amendments avoid such references or objections. See 37 C.F.R. 1.111 (c).
8. When responding to the office action, Applicants are advised to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist examiner to locate the appropriate paragraphs.
9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jasmine Song whose telephone number is 703-305-7701. The examiner can normally be reached on 8:00-4:30.

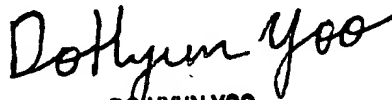
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Do H Yoo can be reached on 703-308-4908. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-9731 for regular communications and 703-305-9731 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

Jasmine Song  
Patent Examiner



March 7, 2002

  
DO HYUN YOO  
SUPERVISORY PATENT EXAMINER  
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